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10/623,159

07/21/2003

Hiroyuki Fujimura

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11/13/2006

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WASHINGTON, DC 20006-1021

EXAMINER

WILKINS III, HARRY D

ART UNIT

PAPER NUMBER

1742

DATE MAILED: 11/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/623,159

Applicant(s)

FUJIMURA ET AL.

Examiner

Harry D. Wilkins, III

Art Unit

1742

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 10 October 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-4 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### Status

1. The rejection of claim 1 under 35 USC 112, 2<sup>nd</sup> paragraph has been withdrawn in view of Applicant's corrective amendment.

### Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pham et al (US 6,051,125) in view of Gregg (US 4,229,184) and one or more of Chiaramonte (US 4,312,740) OR Keller et al (US 4,953,479) OR Shaw (US 6,736,955).

Pham et al teach (see abstract, figure 3 and col. 4, lines 1-23) a method for producing hydrogen including supplying a carbon containing gas (methane) to the anode side of a solid oxide diaphragm electrolyzer (see phenomenon 1), supplying steam to the cathode side of the electrolyzer, generating hydrogen and oxygen by

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electrolytic action and the oxygen produced at the cathode side passing through the diaphragm to react with the reducing gas to create a concentration gradient of oxygen ions (see phenomenon 4). Pham et al teach preferably using methane to be fed to the anode side of the electrolyzer, however, Pham et al do suggest using any reducing gas as the anode side feed (see col. 4, lines 51-58). Thus, it would have been within the expected skill of a routineer in the art to seek out alternative reducing gases to avoid the excessive costs of natural gas (methane).

Thus, Pham et al fail to teach that the anode feed gas was a reducing gas composed mainly of  $H_2$  and CO produced in a pyrolyzer of organic material biomass, such as waste wood or raw refuse.

Gregg teaches (see abstract and col. 2) the production of a synthesis gas ( $H_2$  and CO) by pyrolytic decomposition of municipal wastes or wood chips. Steam is fed to the fluidized bed pyrolysis furnace to assist in the reaction.

Therefore, it would have been obvious to one of ordinary skill in the art to have used the synthesis gas produced by the method of Gregg to provide the reducing gas to the electrolyzer of Pham et al because the gas produced by Gregg provided environmental benefits by consuming raw refuse while also utilizing solar energy.

Pham et al do not teach utilizing the high temperature gas to preheat incoming water to form the steam reactant fed to the pyrolysis device and the electrolyzer (i.e.- "supplying a high temperature gas, which is generated in said anode side of said electrolyzer, to a heat exchanger; and supplying steam produced in said heat exchanger to a pyrolysis fluidized bed of said pyrolysis furnace that produces the

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reducing gas, wherein the steam supplied to said cathode side of said electrolyzer is produced in said heat exchanger.”).

However, it was well known in the chemical arts at the time of invention to utilize excess heat present in a product stream to preheat reactants to improve overall energy conservation. Examples of such knowledge can be seen in Chiaramonte (col. 3, lines 21-41 and figure 4), Keller et al (figure 1 and col. 10, lines 37-57) and Shaw (figures 1 and 3 and col. 8, lines 57-67).

Therefore, it would have been obvious to one of ordinary skill in the art to have utilized excess heat of the hot anode product gas stream (with temperature approximately 800-1000°C as taught by Pham et al) to preheat incoming water/steam in the system for the purpose of overall energy conservation. Since both the pyrolysis device of Gregg and the steam electrolyzer of Pham et al required a feed of steam, one of ordinary skill in the art would have been motivated to have utilized the steam so generated to be fed to both devices to reduce reliance on additional energy resources for producing the steam. Specifically, Chiaramonte teaches feeding hot product gases to a heat exchanger along with water to the opposite side of the heat exchanger to form a cooled product gas and steam. This steam is utilized as a reactant at another portion of the system. Thus, one of ordinary skill in the art would have been motivated to have modified the system of Pham et al and Gregg to have captured excess heat present in the anode product gas stream to generate the steam for feeding to the electrolyzer and pyrolysis furnace in order to conserve energy.

***Response to Arguments***

5. Applicant's arguments with respect to claim 1 have been considered but are moot in view of the new ground(s) of rejection.

6. With respect to Applicant's arguments about the absence of carbon deposited on the electrodes by using the CO/H<sub>2</sub> gas instead of natural gas/methane utilized by Pham et al, Applicant has failed to provide the data supporting this conclusion within the specification as filed or in the form of a declaration under 37 CFR 1.132. As such, it has not been given patentable weight at this time. However, if Applicant were to provide the data supplied with the response filed on 10 October 2006 within the form of a declaration under 37 CFR 1.132, it appears that the result of avoidance of carbon deposition achieved by the present invention would be considered an unexpected result over the disclosure of Pham et al.

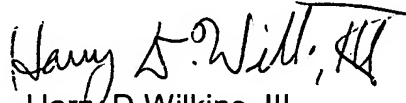
***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D. Wilkins, III whose telephone number is 571-272-1251. The examiner can normally be reached on M-F 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V. King can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Harry D Wilkins, III  
Primary Examiner  
Art Unit 1742

hdw